

WHAT IS CLAIMED IS:

- 1 1. A robotic surgical tool comprising:
2 a distal member configured to support an end effector, wherein the distal
3 member has a base; and
4 a plurality of rods movable generally along an axial direction to adjust an
5 orientation of the distal member with respect to the axial direction, wherein the rods are
6 rotatably connected to the base and extend generally along the axial direction and wherein
7 advancement or retraction of a first rod generally along the axial direction tips the base
8 through a first angle so that the distal member faces a first articulated direction.
- 1 2. A robotic surgical tool as in claim 1, wherein the first angle is greater
2 than approximately 30 degrees.
- 1 3. A robotic surgical tool as in claim 2, wherein the first angle is greater
2 than approximately 60 degrees.
- 1 4. A robotic surgical tool as in claim 3, wherein the first angle is greater
2 than approximately 70 degrees.
- 1 5. A robotic surgical tool as in claim 1, wherein advancement or
2 retraction of a second rod generally along the axial direction tips the base through a second
3 angle so that the distal member faces a second articulated direction.
- 1 6. A robotic surgical tool as in claim 5, wherein the second angle is
2 greater than approximately 30 degrees.
- 1 7. A robotic surgical tool as in claim 5, wherein the plurality of rods
2 comprise three rods.
- 1 8. A robotic surgical tool as in claim 5, wherein the plurality of rods
2 comprise four rods.
- 1 9. A robotic surgical tool as in claim 8, wherein the first and second rods
2 are adjacent to each other.
- 1 10. A robotic surgical tool as in claim 1, further comprising a plurality of
2 linkages, each linkage connecting one of the plurality of rods with the base.

1 11. A robotic surgical tool as in claim 10, wherein the linkage comprises
2 an orthogonal linkage having a first link portion which is rotatably connectable with the one
3 of the plurality of rods and a second link portion which is rotatably connectable with the base
4 and wherein the first link portion and the second link portion lie in orthogonal planes.

1 12. A robotic surgical tool as in claim 1, further comprising a tool base
2 having means for advancing or retracting the first rod.

1 13. A robotic surgical tool as in claim 12, wherein the tool base has a first
2 rotational actuation member to which the first rod is attached so that rotation of the first
3 sector rotational actuation member advances or retracts the first rod.

1 14. A robotic surgical tool as in claim 13, wherein another rod is attached
2 to the first rotational actuation member in a position diametrically opposite to the first rod so
3 that rotation of the first rotational actuation member simultaneously advances the first rod
4 and retracts the another rod.

1 15. A robotic surgical tool as in claim 14, wherein rotation of the first
2 rotation actuation member simultaneously advances the first rod and retracts the another rod
3 by the same amount.

1 16. A robotic surgical tool as in claim 13, wherein the tool base further
2 comprises a second rotational actuation member to which the second rod is attached so that
3 rotation of the second rotational actuation member advances or retracts the second rod
4 substantially along the axial direction and tips the base through a second angle so that the
5 distal member faces a second articulated direction.

1 17. A robotic surgical tool as in claim 16, wherein the tool base further
2 comprises a roll pulley which rotates first and second rods around a central axis which is
3 parallel to the axial direction.

1 18. A robotic surgical tool as in claim 13, wherein the tool base further
2 includes means for actuating the end effector.

1 19. A robotic surgical tool as in claim 18, wherein the end effector
2 comprises grasping jaws, DeBakey forceps, microforceps, Potts scissors, a clip applier, a
3 scalpel or an electrocautery probe.

1 20. A method of actuating a robotic surgical tool comprising:
2 providing a robotic surgical tool comprising a wrist including
3 a distal member coupleable with a surgical end effector and having a base, and
4 a plurality of rods rotatably connected to the base and extending along an axial
5 direction;
6 actuating the wrist by manipulating a first rod of the plurality of rods to tip the
7 base through a first angle so that the distal member faces a first articulated direction.

1 21. A method as in claim 20, wherein manipulating comprises advancing
2 or retracting the first rod.

1 22. A method as in claim 21, wherein advancing or retracting comprises
2 rotating a first rotational actuation member to which the first rod is attached.

1 23. A method as in claim 22, wherein another rod is attached to the first
2 rotational actuation member in a position diametrically opposite to the first rod and wherein
3 rotating the first rotational actuation member simultaneously advances the first rod and
4 retracts the another rod.

1 24. A method as in claim 23, wherein rotating the first rotational actuation
2 member simultaneously advances the first rod and retracts the another rod by the same
3 amount.

1 25. A method as in claim 22, wherein actuating the wrist further comprises
2 manipulating a second rod of the plurality of rods to tip the base through a second angle so
3 that the distal member faces a second articulated direction.

1 26. A method as in claim 25, wherein advancing or retracting comprises
2 rotating a second rotational actuation member to which the second rod is attached.

1 27. A method as in claim 20, further comprising actuating the wrist by
2 rotating the plurality of rods around a central axis parallel to the axial direction to rotate the
3 base.

1 28. A method as in claim 27, wherein rotating the plurality of rods
2 comprises rotating a roll pulley through which the plurality of rods extend.

1 29. A method as in claim 20, further comprising coupling the end effector
2 to the base and actuating the end effector.